Engineers Australia

Engineering Heritage Victoria

Nomination

Engineering Heritage Australia Heritage Recognition Program

LOY YANG POWER STATION COMPLEX

July 2018

Front Cover Photograph Caption

Loy Yang Power Station complex viewed from the East. From left to right the components are:

- Loy Yang B power station boilers and turbine house (2 units)
- Loy Yang B cooling tower (a further cooling tower is hidden behind the buildings)
- Loy Yang B stack (2 units share one stack)
- Loy Yang A cooling towers (2 units)
- Loy Yang A power station boilers and turbine house (2 units in each block for a total of 4 units)
- Loy Yang A two stacks (2 units per stack)
- Loy Yang A cooling towers (2 units)

Image: Owen Peake.

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1 Heritage Award Nomination Letter

Learned Society Advisor
Engineering Heritage Australia
Engineers Australia
Engineering House
11 National Circuit
BARTON ACT 2600

Name of work: **Loy Yang Power Station Complex**

The above-mentioned work is submitted for an Engineering Heritage Marker (EHM).

Location, including address and map grid reference: Bartons Lane, Traralgon VIC 3844. Loy Yang A and Loy Yang B Power stations are both situated in the Latrobe Valley, 165 kilometres east of Melbourne.

Map grid reference of the power stations:
38°15'16"S 146°34'37"E (Loy Yang A)

38°15'23"S 146°35'10"E (Loy Yang B)

Owners:

Loy Yang A is owned by the Australian Gas Light (AGL) Company, their Head office address is Level 24, 200 George Street, Sydney, NSW, 2000. Mailing address is Locked Bag 1837, St Leonards, NSW, 2065.

Loy Yang B is now owned by Alinta Energy. Alinta Energy's owner, CTFE, acquired the Loy Yang B Power Station from ENGIE. in January 2018. Alinta Energy Head Office is Grosvenor Place, Level 13, 225 George Street, Sydney NSW 2000. Victorian Postal address is PO Box 16196, Collins Street West VIC 8007.

The owners have been advised of this nomination and a letter of agreement is attached.

Access to site:

Both sites are operational and not open not open for public access. On-site inspection of the power stations is only possible by specific arrangement with the respective sites. The exterior of the complex can be viewed from the public road (C482) Hyland highway which runs through the site.

Nominating Body: Engineering Heritage Victoria

David LeLievre
Chair
Engineering Heritage Victoria

Date: July 2018

2 Introduction

With the closure of Hazelwood Power Station (2017), Anglesea Power Station (August 2014) and Morwell Power Station (August 2014) Loy Yang A and Loy Yang B Power Stations, together with Yallourn W Power Stations are the only coal fired power stations still in operation in Victoria.

These remaining power stations burn brown coal (lignite) to generate steam.

The fuel for Loy Yang A and B Power Station is sourced from the adjacent Loy Yang Mine and delivered via an extensive network of conveyors and storage bunkers.

The two Loy Yang power stations have a combined capacity exceeding 3000 MW, generating about half of Victoria's electricity needs.

Loy Yang working hard on a cold winter day – viewed from within the mine. Image: Owen Peake.

3 Basic Data

Item Names: Loy Yang A & B Power Stations, Loy Yang Power Station complex

Other/Former Names: nil

Loy Yang A Power Station

Loy Yang A Power Station was originally owned and operated by the State Electricity Commission of Victoria. It was corporatised in 1995 and sold to a private sector consortium trading as Loy Yang Power (Great Energy Alliance Corporation). AGL, a partner in the consortium from 2004, acquired 100% of the business in 2012.

Loy Yang A is currently owned by the Australian Gas Light (AGL) Company, their Head office address is Level 24, 200 George Street, Sydney, NSW, 2000. Mailing address is Locked Bag 1837, St Leonards, NSW, 2065.

Loy Yang B Power Station

Prior to the Victorian Government's privatisations from the mid-1990s, a 49% stake of Loy Yang B was sold to Mission Energy. Later Edison Mission bought the complete plant, and later again sold it to the joint venture International Power - Mitsui. (Later ENGIE/Mitsui). The business was on sold to Alinta Energy in 2018.

Loy Yang B is currently owned by Alinta Energy. Alinta Energy's owner, CTFE, acquired the Loy Yang B Power Station from ENGIE in January 2018.

Alinta Energy Head Office is Grosvenor Place, Level 13, 225 George Street, Sydney NSW 2000. Victorian Postal address is PO Box 16196, Collins Street West VIC 8007

Location of Loy Yang A and B Power Stations:

Map grid reference of the power stations:

Loy Yang A - 38°15′16″S 146°34′37″E

Loy Yang B - 38°15'23"S 146°35'10"E

Both Loy Yang Power Stations are situated in the Latrobe Valley, 165 kilometres east of Melbourne.

Address: Bartons Lane, Traralgon VIC 3844.

Suburb/Nearest Town: Traralgon

State: Victoria

Local Govt. Area: Latrobe City Council

Dredger winning coal and delivering it to a conveyor on a lower level. Image: Owen Peake.

Current Use:

The Power Stations are currently operating and connected to the National Electricity Grid.

Former Use: nil

Designer:

State Electricity Commission of Victoria (SECV) co-ordinated the project.

Maker/Builder: International Combustion Australia Ltd.

Boilers - All six Loy Yang boilers are Sulzer type of the forced circulation tower type boiler constructed by International Combustion Australia Ltd.

Turbo-alternators – Turbines are tandem compound reheat units of four cylinders.

Units 1,3, and 4 were built by Kraftwerk Union with Siemens alternators

Unit 2 was built by ASEA Brown Boveri

Year Started:

Construction of Loy Yang A Power Station commenced in 1977 and the first unit came into service in 1884.

The first unit of Loy Yang B Power Station came into service in 1993.

Year Completed:

Loy Yang A unit 4 was commissioned in 1988.

Loy Yang B unit 2 was commissioned in 1996.

Physical Condition:
Both Loy Yang A and B are in an excellent condition. There are currently more than 500 workers maintaining Loy Yang A and about 190 employees working at Loy Yang B power station.

All the units at Loy Yang A were converted from analogue control systems to digital control systems in 2014 [4].

4 Physical Description

The Loy Yang complex consists of two separate Power Stations, Loy Yang A and Loy Yang B. Constructed in stages.

It was originally planned that the Loy Yang would consist of eight generating units, of 500 megawatts each. The privatisation process with SECV assets resulted in only six generating units being completed, four in Loy Yang A and two in Loy Yang B.

Kraftwerk Union 500 MW turbo-alternator in Loy Yang A from the high pressure turbine end. Image: Owen Peake.

Loy Yang A power station boilers include the following features:

- Draft plant consisting of two induced draft (ID) fans; two forced draft (FD) fans; two rotary air heaters; auxiliary systems; ducting; dampers; draft plant controls and one chimney for each pair of units.

- Auxiliary firing equipment: three briquette bunkers; bunker gates; table feeders and bowl mills.

- Main firing equipment: bunker; bunker gates; coal feeder conveyors; coal feeder discharge dampers; eight pulverised fuel mills; burners and main firing equipment controls.

- Pulverised Fuel (PF) equipment: exhausters; PF pipes connecting to twelve PF burners (3 levels on each of the 4 furnace walls); natural gas ignitors and pilot burners; gas piping; gas control system; flame scanning system and flame scanning system controls.

- Precipitators: electrostatic dust precipitators; precipitator controls and dust handling system.

- Boiler structure and pressure parts: furnace enclosure which incorporates the evaporative heating membrane tube water-walls, superheaters, re-heaters and their associated circuit (hanger) tubes; attemperators; economisers; separating and mixing vessels; circulating pumps and strainers; superheater and re-heater safety valves.

- Online boiler cleaning: including remote, manual and automatic equipment and controls for both convection bank lance soot-blowers and furnace water cannons [2] are installed to remove slag and ash deposits from the boiler for more efficient heat transfer and to reduce gas path resistance.

Loy Yang A Power Station, Unit 2

The Brown Boveri turbo-alternator was originally destined for the second unit at the gas-fired Newport Power Station but this development did not proceed. The then surplus unit was then assigned to Loy Yang A. This turbo-alternator unit is unusual in design in that it is capable of rapid load-following service. At Loy Yang it is however constrained by the characteristics of the boiler which is of more conventional design as a base-load boiler.

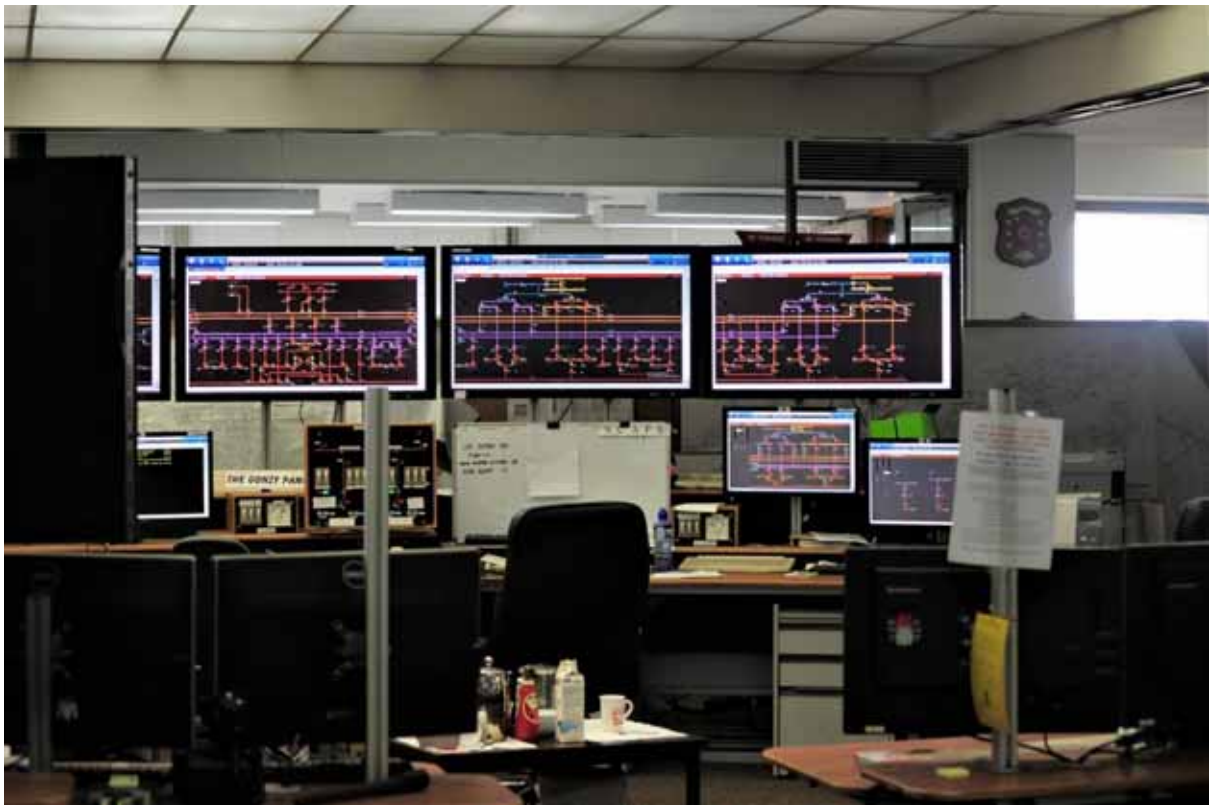
Loy Yang B Power Station

Loy Yang B consists of two units with Hitachi turbo generators.

Power Station Development.

Since original commissioning, all units have been upgraded from their original 500 MW nameplate capacity. At Loy Yang A three units have a generating capacity of 560 MW and the other, 530 MW. At Loy Yang B, each unit has a capacity of 525 MW.

Over 7 years, up until 2014, the control systems for all 4 units at Loy Yang A have been converted from analogue systems to digital systems, offering increased reliability and greater flexibility.



Control Room in Loy Yang A. This control position controls one unit. This image is after the recent control system upgrade. Image: Owen Peake.

The Loy Yang Mine

The Loy Yang open cut brown coal mine is owned and operated by AGL. The mine has reserves totalling 168 billion tonnes and mines, on average, around 30 million tonnes each year. The overburden covering the coal seam is between five and 24 metres thick with the coal seam thickness averaging around 180 metres. The brown coal deposit, estimated to be about 15 to 30 million years old, has a low sulphur trace element count and a low ash content of only about two percent.

Coal and overburden is excavated by four electric powered bucket wheel dredgers, up to 190 metres long and 50 metres high. Each weighing around 5,000 tonnes and able to excavate 4,000 tonnes of coal per hour. The coal is transported from the mine to the power station by conveyors. Travelling Stackers are used to deposit overburden in the Overburden Dump to the south of the power stations.

Coal mining began at the Loy Yang Mine in 1982.

Early development work in the Loy Yang Mine. Removal of overburden. Image: Ian Newnham.

Loy Yang A & B Power Stations with the mine in the foreground. Image Ian Newnham

5 Historical Notes and Heritage Listings

See section 6.1 below.

The table below shows the timeline of critical events that contributed in the Loy Yang Power Station history.

Year	Timeline
1976	The Plan to build the Loy Yang Power Station is agreed by the Government.
1977	The construction for Loy Yang A is started.
1984	The construction of the A station is completed and it started to generate electricity the same year.
1992	The construction for Loy Yang B is started.
1993	Loy Yang B is completed and the first turbine started to generate electricity.
1994	SECV is disaggregated by the Government led by the Premier Kennett.
1995	Loy Yang B became the first brown coal fired station to be accredited with ISO 9001.
1996	The second unit at Loy Yang B started to generate electricity.
2000	A station was upgraded to make the power station generates 2200 MW.
2004	Loy Yang A power station sold to the Great Energy Alliance Corporation.
2007	The project to change all the analogue controls to digital at Loy yang A is started.
2012	AGL acquired the complete ownership of Loy Yang A Power Station. ENGIE bought the major shares of Loy Yang B Power Station
2014	Conversion of the control systems on Loy Yang A Power Station from analogue to digital completed.
2017	Environment Protection Authority Victoria (EPA) has approved the upgrade of the steam turbines at Loy Yang B Power Station.

Heritage Listings

No existing listings are known.

Kraftwerk Union logo on Loy Yang A machine.

Image: Owen Peake.

6 Assessment of Significance

6.1 Historical significance:

Coal Mining

Victoria experienced a gold rush in the early 1850s. Within 10 years, the population of Victoria had increased many fold. [5] . After the gold rush, the gold miners began to settle down, developing the land and creating farms and industries all across Victoria.

Although the Victorian gold rush was over, Henry Godridge continued his gold quest and in 1874 he discovered brown coal in the Latrobe Valley [6]. However, it was only in the 1910's that Dr Hyman Herman examined the possible use of brown coal through his research in the Latrobe Valley. At that time, the price of importation of black coal from New South Wales was exorbitant and brown coal became an attractive option for the production of electricity.

In 1917, Dr Herman became the Chairman of the State Advisory Committee on coal and electricity. He worked with Herbert Harper and William Stone, looking for ways to use brown coal as an energy source [7]. This was the first step towards coal-fired power stations using brown coal in Victoria.

In 1974, SECV identified the Loy Yang site as a suitable mine and power station site for the production of electricity.

Loy Yang Power Station

In the mid-1970s, electricity demand in Victorian was predicted to continue to increase rapidly. J C Trethowan (Chairman of SECV at that time) together with T P Scott, B J Callinan and Sir Roger Darvall as Commissioners, decided to build the Loy Yang Power Station. Loy Yang Power Station was planned to be in two stages (Loy Yang A and Loy Yang B), with a total of eight generating units each of 500 MW capacity. The project was approved by the Victorian government in 1976. The construction of Loy Yang A started in 1977.

The A station comprised four 500 Megawatt turbo generators (3 of Siemens manufacture and one by Brown Boveri (BBC) which were brought into service between 1984 and 1988. The BBC generator was intended to be the second unit of Newport's gas-fired Power Station but due to pressure from local residents and the Trades Union Council, the State Electricity Commission of Victoria had to alter its plan and built only one machine at Newport Power Station.

There was delay in the construction of Loy Yang B Power Station. In 1988, the government decided to review the plan for Loy Yang B power station and decided to build only two

machines. The construction for Loy Yang B started in 1992 under the supervision of SECV but privatisation occurred before the plant was completed.

In 1993, the Victorian government decided to privatise the power industry resulting in the disaggregation of the State Electricity Commission of Victoria. Loy Yang B was sold to International Power plc (70%) and Mitsui & Co. Ltd (30%). The first machine was commissioned in 1993 and the second unit in 1996.

With Loy Yang B completed, the power station became the largest, and possibly the last, brown coal fired station to be built in Victoria.

AGL and Alinta Energy

Since June 2012, AGL has acquired full ownership of Loy Yang A power station while Loy Yang B power station's transferred to Alinta Energy in 2018.

6.2 Historic Individuals or Association:

Herbert Reah Harper

Herbert Reah Harper (1871-1956), after having studied engineering in England, became an electrical engineer. He was employed by Brush Electrical Engineering Co in 1893 and gained valuable experience supervising various projects in Malta and London. In 1899 he was sent to Melbourne to work as an assistant for one of the company's subsidiaries.

In 1901, Harper was appointed as Electrical Engineer for Melbourne City Council (MCC). With his broad knowledge, he improved the power generated throughout the MCC supply area. He also introduced the three phase electrical system in the MCC supply area.

He was fascinated by the use of brown coal in Germany during an overseas tour. Due to the constant disruption in the importation of black coal from NSW he joined the Victorian Government Brown Coal Advisory Committee which was chaired by Hyman Herman to find ways of using the vast Victoria brown coal resources to generate electricity. The report of that committee was later used as a blueprint for the Yallourn Power Station [8].

In 1919, he successfully applied to become the Chief Engineer for the State Electricity Commission of Victoria. He retired in 1936. Though he was not directly involved in the construction of Yallourn Power Station, his work in brown coal mining and the various projects that improved the distribution of electricity made him a pillar for the brown coal-fired stations in Victoria.

State Electricity Commission of Victoria (SECV)

The government decided to create Victorian Electricity Commissioners in 1919 under the Electricity Commissioners Act 1918. The Electricity Commissioners Act 1918 was implemented to regulate and improve the electricity sector in Victoria. In 1921, The Victorian Electricity Commissioners became the State Electricity Commission of Victoria (SECV) was created in under the State Electricity Commission Act 1920. SECV had total control of electricity generation, transmission and distribution across the state [9].

SECV logo as used by 1980. Image: Wikimedia Commons.

General Sir John Monash became the first Chairman and General Manager of SECV. Apart from Monash and Harper, the other commissioners were Sir Robert Gibson, (Sir) Thomas Lyle, George Swinburne and Hyman Herman as chief technical expert [10]. They were all strong personalities.

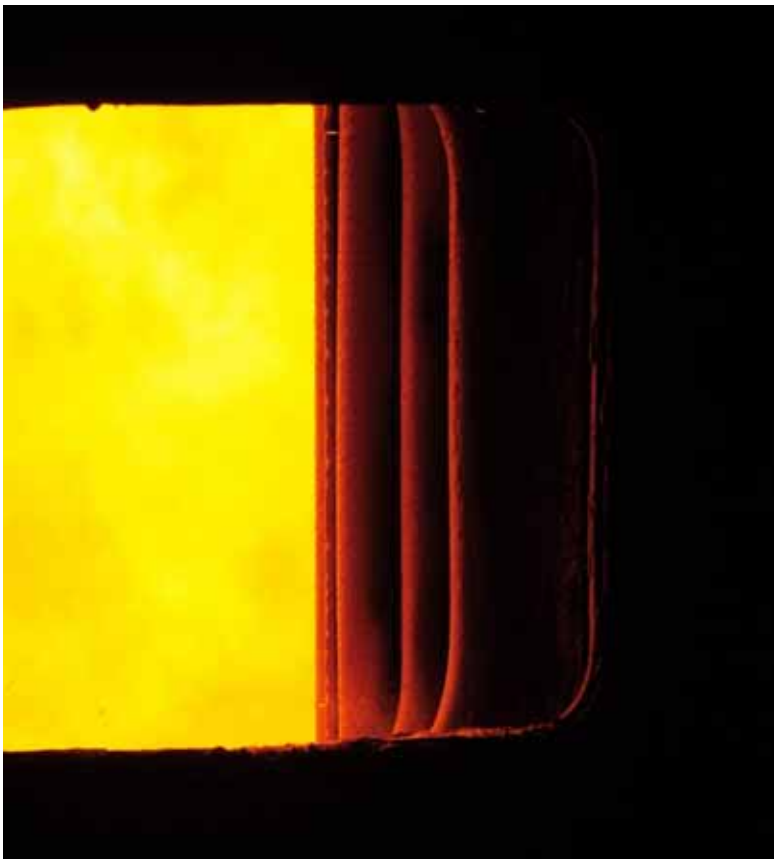
One of the first projects of SECV was the construction of Yallourn Power Station, which would generate electricity using brown coal. Yallourn Power Station was built in five stages (A, B, C, D and E). Yallourn A power station, the first brown coal-fired power station in Victoria, was built in 1924. Yallourn B was constructed in 1938 and Yallourn C in 1956 followed by Yallourn D in 1958. Yallourn E finally completed the Yallourn Power Station in 1962. In 1974, all the units of Yallourn Power Station were demolished and were replaced by Yallourn W Power which had bigger capacity and later technology. SECV also worked on the extension of Newport Power Station, the Hydroelectric Scheme at Rubicon.

World War II disrupted the advancement of the power industry in Victoria.

The State Electricity Commission of Victoria was recognised as an established business when Sir John Monash died in 1931. The work towards developing the power industry in Victoria continued long after Monash died.

In 1993, the Kennett Government decided to privatise the electricity industry and disaggregate the State Electricity Commission of Victoria.

Some of the major works undertaken by SECV are detailed in Appendix 4.



Looking into the fire. Water-wall tubes protect the boiler walls from the heat of the swirling coal fire within. The inspection door can be opened as the forced draft and induced draft fans keep the pressure in the combustion chamber close to atmospheric pressure. Image: Owen Peake.

6.3 Creative or Technical Achievement:

The Loy Yang Power Station is the largest and most efficient of the series of power stations built by the SECV over its seven-decade life. The station also has the largest brown coal fired units in Australia.
The output of the two stages of the station has been upgraded by about 5% by modifications and upgrades during the life of the station.

The station was originally built with analogue control systems, with all A station units now upgraded to digital systems.

Loy Yang A and Loy Yang B together forms the largest power station complex in Australia with generating capacity over 3163 MW[1] and generates about half of Victoria's electricity energy requirements.

6.4 Research Potential:

Under its Energy Technology Innovation Strategy (ETIS) program, The Victorian state government initiated '*capture research'* program. This project combined the services and research support of two power companies, Loy Yang Power and International Power, and the resources and expertise of the carbon capture research programs of Cooperative Research Centre for Greenhouse Gas Technologies (CO2CRC) and Commonwealth Science and Industrial Research Organisation (CSIRO). Its objective is to conduct research and identify prospective technologies for the post-combustion capture (PCC) of carbon dioxide. This aim of this program was to reduce the emission of greenhouse gasses by carbon dioxide capture and storage. The program provided multiple sites where conventional CO_2 capture techniques could be tested at a range of sizes to discover innovations in the technology.

The pilot plant was established at Loy Yang A site in January 2008 and started operation in April 2008. The experimental program began in June 2008 and continued until December 2009.

At Loy Yang, CSIRO operated the 1000 ton per annum PCC pilot plant in order to investigate the technical and economical scale-up information for CO_2 capture plant based on operation with flue gas from brown coal combustion.

This program aimed to determine:

- CO_2 capture energy consumption
- CO_2 capture efficiency
- Solvent CO_2 loading
- Solvent and flue gas flow rates
- Regeneration temperature and pressure
- Absorption temperature
- Solvent consumption and degradation rates
- Fouling and corrosion
- Effectiveness of the conditioning stage
- Reagent loss rate both to acid gas and to release with flue gas
- System water consumption

"The research phase of the project was expected to contribute to future large scale integrated demonstrations of CCS in the Australian scene. While the initial focus is on the brown coal

[1] The capacity of Loy Yang represented 34% of the Victorian Maximum Demand recorded during the first quarter of 2016 [WattClarity].

generators in the Latrobe Valley the findings are expected to be broadly applicable to capture from all fuel types." [14]

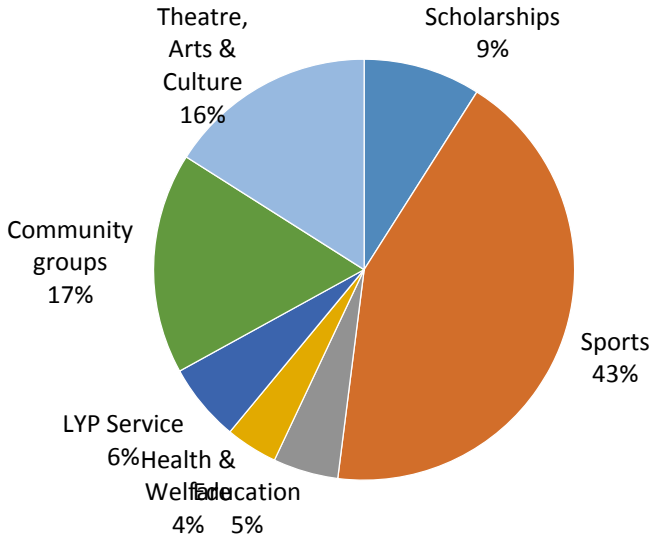
From a heritage perspective, research include the following:

- How would the heritage significance of Loy Yang Power Station have differed if it had been completed to the original plan of eight units totalling over 4000 MW.
- How much was Loy Yang Power Station influenced by the German technology, particularly in the coal-winning area.
- Research could also reveal whether it was the first time that 3-Dimensional representation was used to design a power station in Victoria or Australia (refer to Figure 27 in Appendix 7).

Soot blowers delve into the tubes within the boiler to blow soot off to aid heat transfer. Image: Owen Peake.

6.5 Social:

The Loy Yang Power Station has played an important socio-economic role as a major supplier of electricity to Victoria for the last 34 years since it started its generation in 1984. Under its Community Support program, it offers financial and other support to community groups in the Latrobe Valley region. In 1985 community, cultural, sporting, educational and service groups were benefited from Loy Yang Power Station's Community Support Program, receiving a combined a total of $135,108. See the distribution of these funds as shown in the figure below.



A pie chart illustrating the distribution of funds from the Loy Yang Power Station's Community Support Program.

University students have opportunities of vacation employment over the summer break offered by Loy Yang Power Station, providing work experience that is vital to receiving their degrees. In 2010 8 University and 40 secondary school students were provided with work experience. Moreover, Scholarships of $1,000 were awarded to each of five senior students in the Latrobe Valley for their inspirational community service and the same amount was given to their schools. The survey process, conducted on regular basis since 1998 by Monash University Gippsland, with the aim to evaluate Loy Yang's effectiveness in community relations is consistently showing that the power station is viewed favourably by the local community.

Loy Yang Power Station was previously a major shareholder of the PowerWorks Energy Education Centre which was the public access point to the Latrobe Valley's brown coal power industry. It provided public tours, information and education programs about the industry. In 2010, over 10 000 people visited Loy Yang Power Station on public tours with PowerWorks, including 5,980 school students [15].

PowerWorks closed in February 2013 and following a public meeting, a social enterprise formed as PowerWorks Holdings Ltd.

PowerWorks Holdings Ltd successfully negotiated with the owners of then PowerWorks, GDF Suez Hazelwood, AGL Loy Yang and Energy Australia Yallourn, for the facility to be gifted to the community. PowerWorks Energy Education Centre reopened in March 2015 as a community run, not-for-profit tourist facility.

6.6 Rarity:

Apart from its large size there is nothing rare about the technology at Loy Yang Power Station.

6.7 Representativeness:

Irrespective of the present companies that own Loy Yang A and Loy Yang B, both stages were constructed by SECV through the 1980s. Together they represent the largest power complex in Australia.

Ranking	Name	Location	Coal type	Max. Capacity
1	Loy Yang A & B	VIC	lignite	3163 MW
2	Eraring	NSW	bituminous	2,880 MW
3	Bayswater	NSW	bituminous	2,640 MW
4	Liddell	NSW	bituminous	2,000 MW
5	Gladstone	QLD	bituminous	1,680 MW
6	Yallourn W	VIC	lignite	1480 MW

List of the largest coal-fired power stations in Australia

Loy Yang is possibly the last of its kind of power station in Australia that can produce electricity at this scale. As almost every energy company in Australia plans on upgrading to a renewable energy power production, coal-fuelled power generation may no longer be considered feasible in Australia in the future.

6.8 Integrity/Intactness:

The complex is intact and in good operating condition with only minimal changes since it was first constructed.

Looking down from high up on the boiler structure. Because of the high moisture content and low calorific value of the Latrobe Valley coal these boilers are amongst the tallest in the world. Image: Owen Peake.

6.9 Statement of Significance:

The Loy Yang Power Station complex was commissioned between 1984 and 1993 burning Latrobe Valley brown coal. The power station can provide about 50% of Victoria's energy requirements. It is the largest power station in Victoria. It operates continuously mining coal using dredgers and transporting coal to the station with belt conveyors.

Historically it has been a vital part of the SECV plan to provide cheap, plentiful electricity to the Victorian population and to Victorian industry to promote growth and development in Victoria. In the 1950s the demand of electricity in Victoria increased by 80% [18] . SECV had investigated four areas in 1946 for mining brown coal and planned to build a power station near each mine. Loy Yang Mine was selected after the overall cost comparison for all optional open cuts were taken into consideration.

The power station complex consists of six turbo-alternators of nominally 500 MW capacity each. The boilers are of the tower type and are very large due to the low calorific value of the brown coal and its high moisture content. The turbo-alternators consist of tandem compound reheat steam turbines each with four cylinders driving two pole 3000 revolutions per minute 50 Hz hydrogen cooled alternators. The turbo-alternators come from three different manufacturers. The complex includes an open cut mine and overburden and ash handling facilities and storage.

6.10 Area of Significance:

The Loy Yang Power Station complex is:

- Is of local significance as it forms a part of the power generation industry, which has historically been the largest employer in the Latrobe Valley since the 1920s.
- Is of state significance as it provides approximately 50% of the state's electric energy requirements.
- Is of national significance as it is the largest power station complex in Australia and one of very few using brown coal as its fuel.

One of the four natural draft cooling towers of Loy Yang A.
Image: Owen Peake.

Massive steel support column for boiler at Loy Yang A. The boilers are suspended from the top structure at the top of these columns. Image: Owen Peake.

Ductwork at the rear of a Loy Yang A boiler. Image: Owen Peake.

Dust collection at the base of electrolytic precipitators. Image: Owen Peake.

7 Interpretation Plan

7.1 General Approach

As part of the Engineering Heritage Program, it is intended to have a Heritage Recognition Ceremony if the owners of Loy Yang Power Station support this objective. The Ceremony date and location will be negotiated between Engineering Heritage Victoria and the owners.

Loy Yang Power Station consists of two stages with different owners; therefore, it may be logical to have two Interpretation panels. The locations of the panels will be decided after discussion with the owners.

7.2 The Interpretation Panel

Engineering Heritage Australia typically uses a standard interpretation panes with the following general characteristics:

- Size to be 1200 mm wide x 600 mm high (standard panel).
- The panels constructed of vitreous enamel-on-steel or vinyl-on-aluminium with flanges.
- Panels are to be mounted on steel fabricated frames.

7.3 Possible Interpretation themes for Interpretation Panels

- History of Loy Yang Power Station
- The Largest brown coal fired power station in Australia
- Loy Yang, the final outcome of a century of progress in brown coal research
- The 'endangered' Loy Yang Power Station in a world increasingly looking for renewable energy solutions.

Dredger removing overburden above the coal seam. Image: Owen Peake.

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9 Acknowledgments, Authorship and General Notes

9.1 Acknowledgments

Engineering Heritage Victoria acknowledges the contribution made by engineering students Tiem Do, Muhammad Faheem and Lucas Vaz in the preparation of the original nomination as part of their work Experience project.

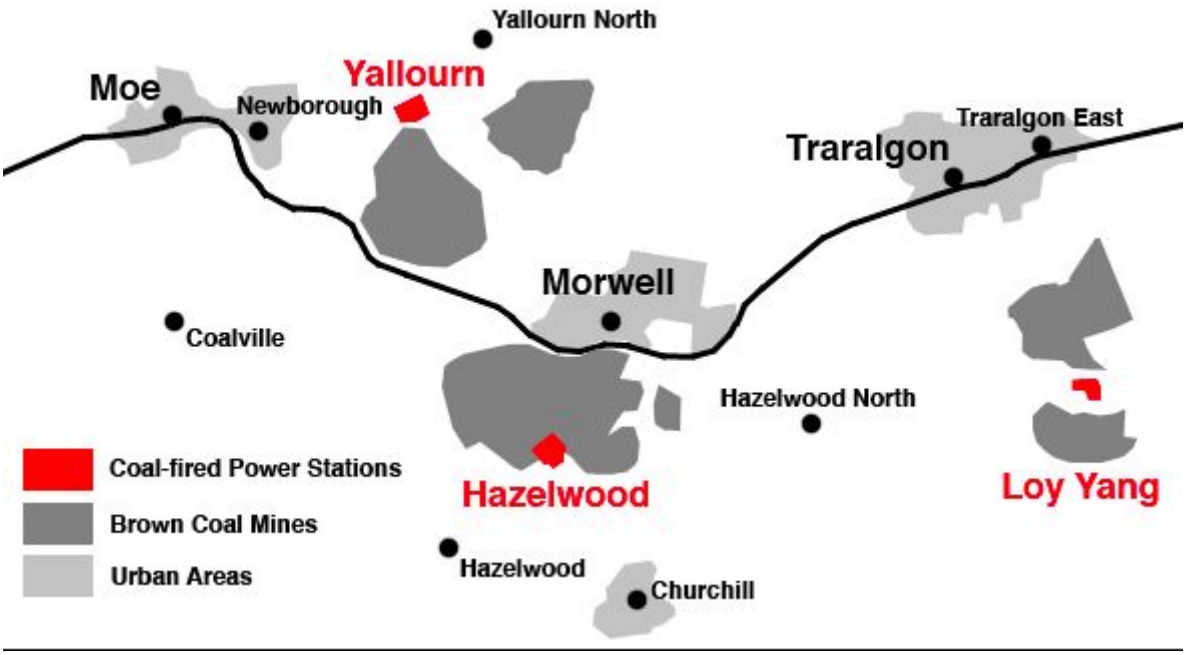
9.2 Nomination Preparation

This nomination (Version 8) was prepared by Ian Newnham and Owen Peake for specific use in the heritage recognition of the Loy Yang Power Station Complex based on version 7 completed by the students.

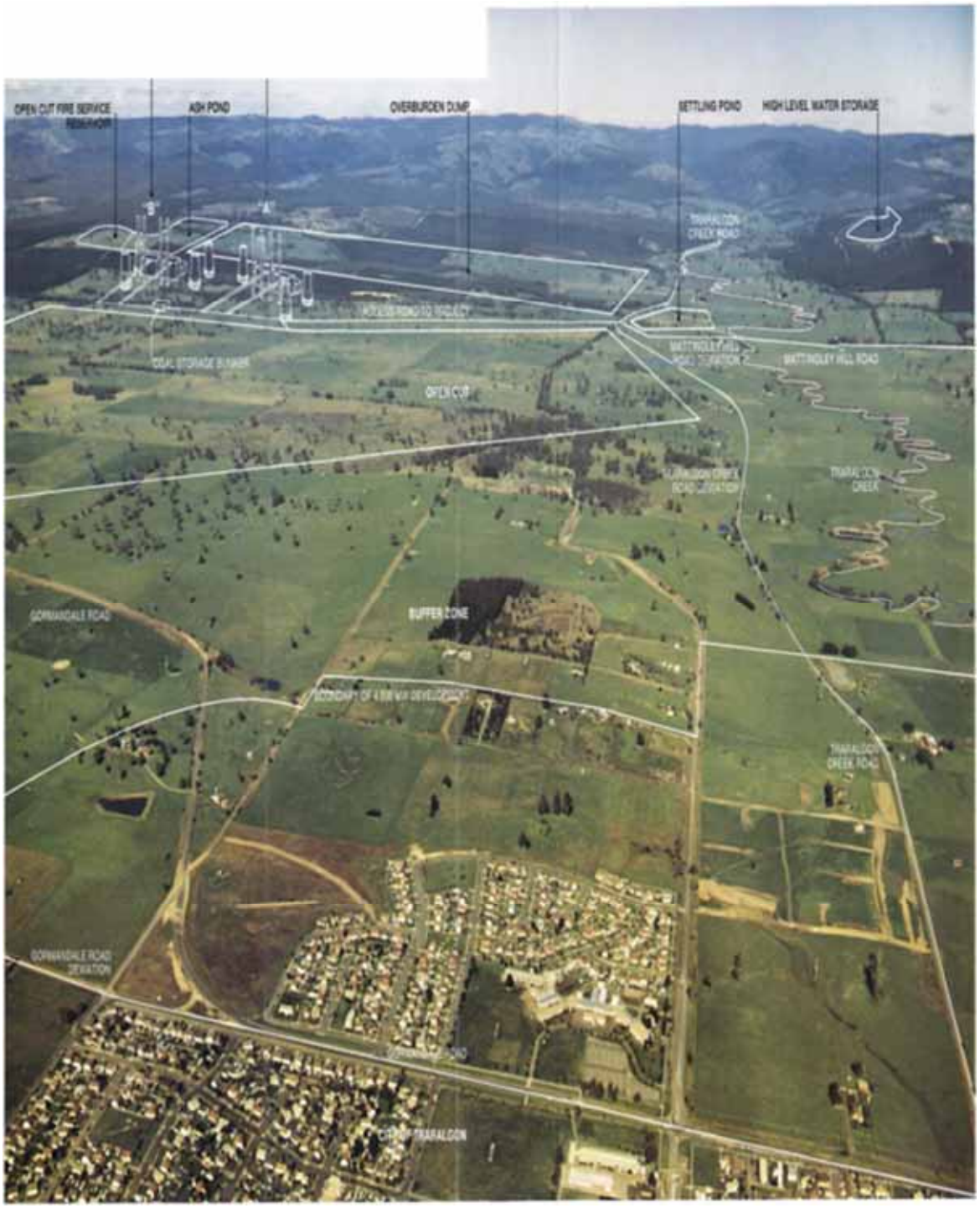
9.3 General Notes

This document has been prepared in accordance with the Commonwealth Government Style Manual for authors, editors and printers, Sixth Edition, revised by Snooks & Co, 2002.

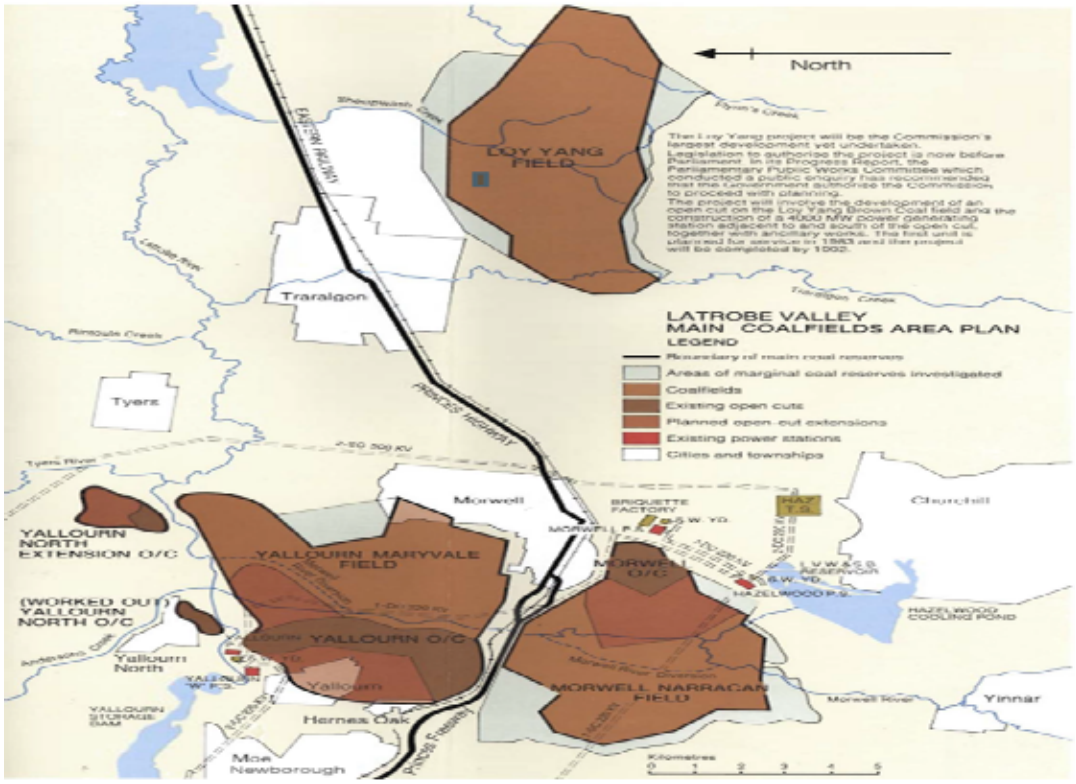
Appendix 1: Maps and Aerial Photographs



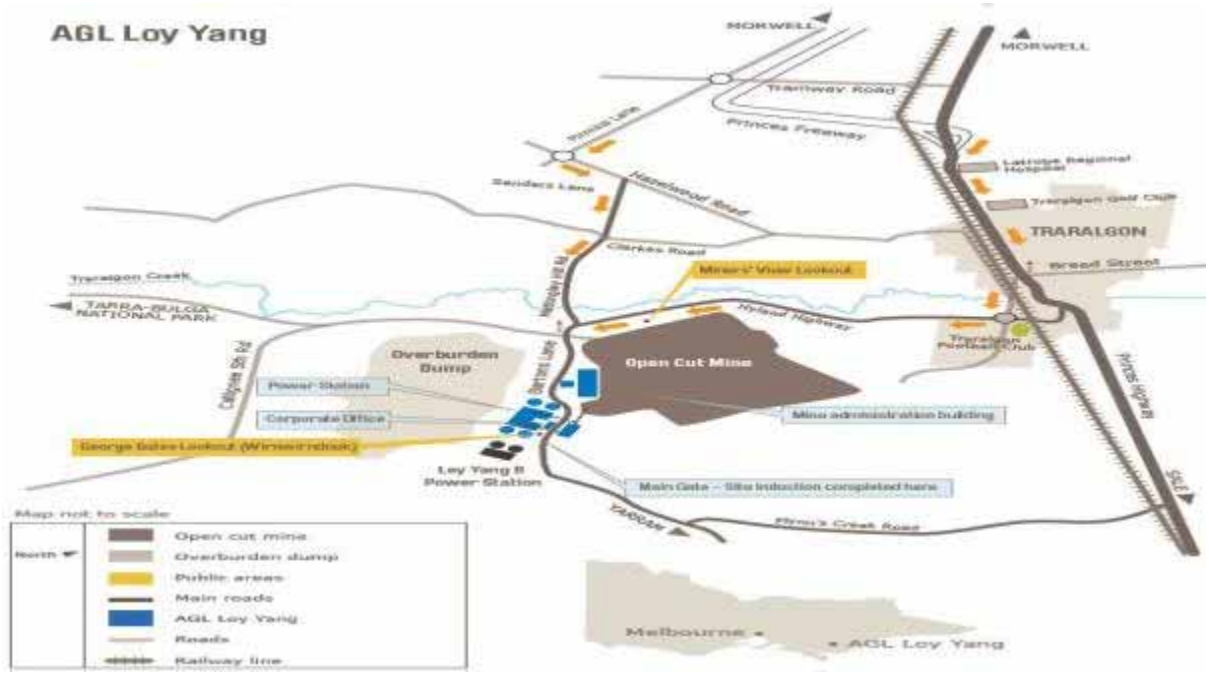
Latrobe Valley Coalfields Plan including power stations and supporting urban areas. Image: Wikimedia.



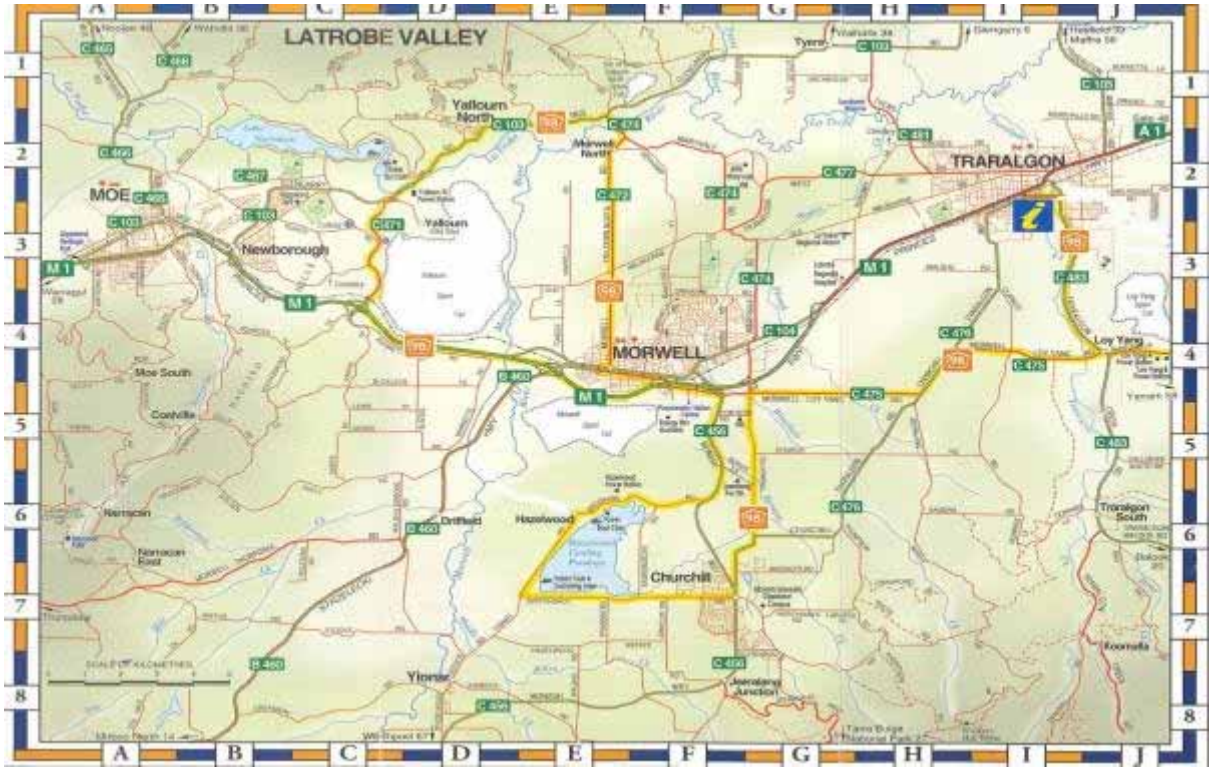
The development plan of the construction of Loy Yang Power Station in 1976. This image is looking south from the outskirts of Traralgon with the Strzelecki Range in the background. Image: SECV, Fifty-seventh Annual report of SECV.



Latrobe Valley Main Coalfields Area Plan, 1976. The Loy Yang Field is at the top of this plan. Image: SECV, Fifty-seventh Annual report of SECV.



An AGL locality plan for Loy Yang with the open cut in brown in the centre; Traralgon township at right; Overburden Dump at left in light beige colour and the power station between the Open Cut and the Overburden Dump in blue. Image: AGL website.



Road map of the Latrobe Valley showing major towns. Morwell near the centre; Traralgon top right; Moe top left and Churchill centre lower. Loy Lang is located at position J4 on the right. Image: Latrobe City Council website.

Satellite image of the Loy Yang Power Station complex. A station at left and B station at right. Image: Google Earth 2016.

Appendix 2: *Physical Condition Design Assumptions*

Site Conditions

Parameter	Units	Value
Barometric Pressure	bar	1.009
Ambient Air Temperature (Dry Bulb)	°C	13.4
Relative Humidity	%	62

Coal Specification

Parameter	Units	Value
Moisture	Wt %	60.0
Carbon (C)	Wt %	27.2
Hydrogen (H)	Wt %	2.0
Sulphur (S)	Wt %	0.2
Oxygen (O)	Wt %	9.5
Nitrogen (N)	Wt %	0.2
Ash	Wt %	0.9
Total	Wt %	100.0

Steam Turbine Inputs and Outputs[2]

Parameter	Units	Value
Main Steam Pressure	MPa (abs)	16.4 (at MSV)
Main Steam temperature	Degrees C	538 (at MSVs)
Hot Reheat Temperature	Degrees C	538 (at RSVs);
Reheat System Pressure Loss	%	10
Condenser Pressure	kPa.(abs)	9.5

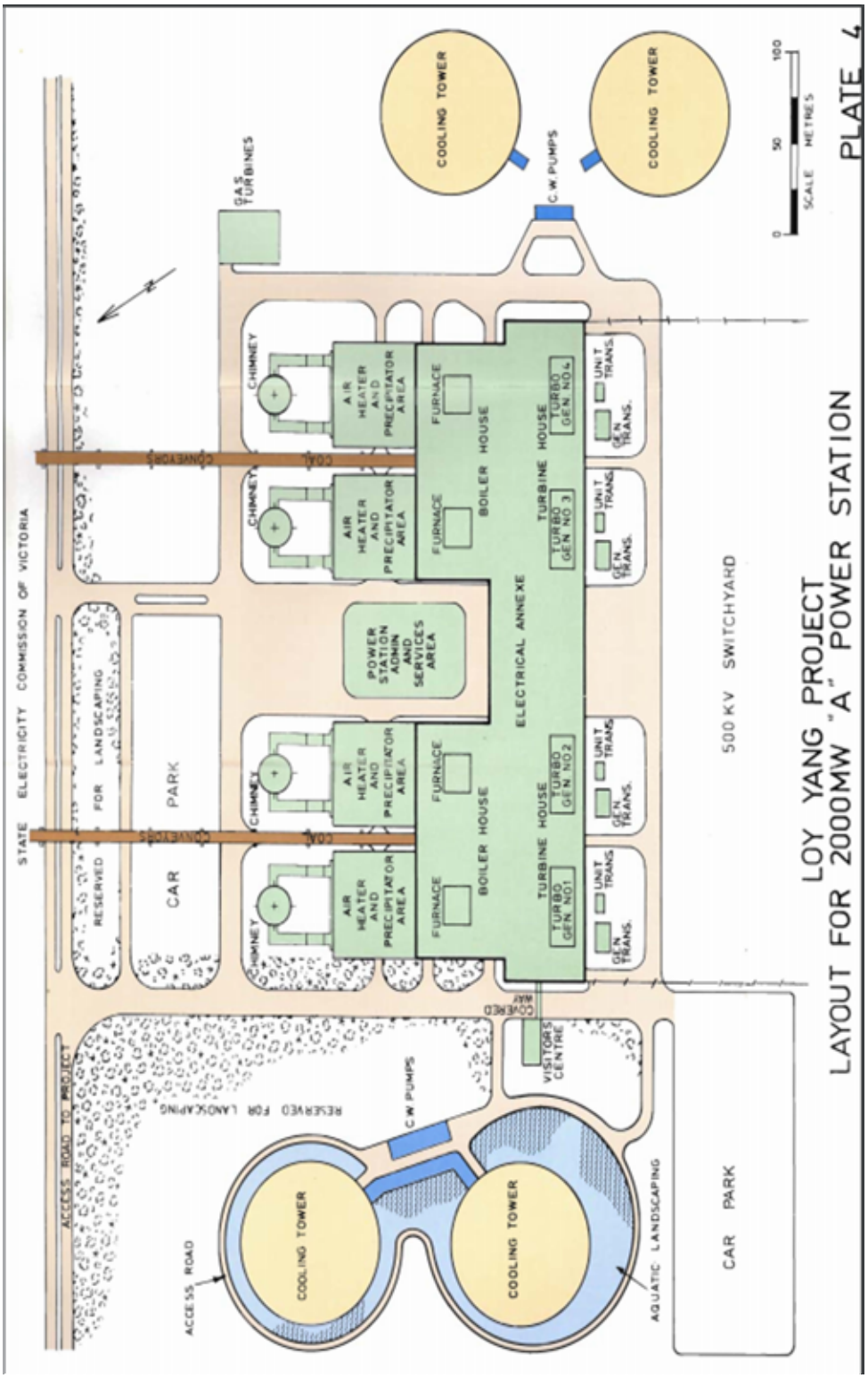
Source: WorleyParsons, Global CCS Institute.

[2] This data refers to Loy Yang A.

Appendix 3: List of Achievements of SECV

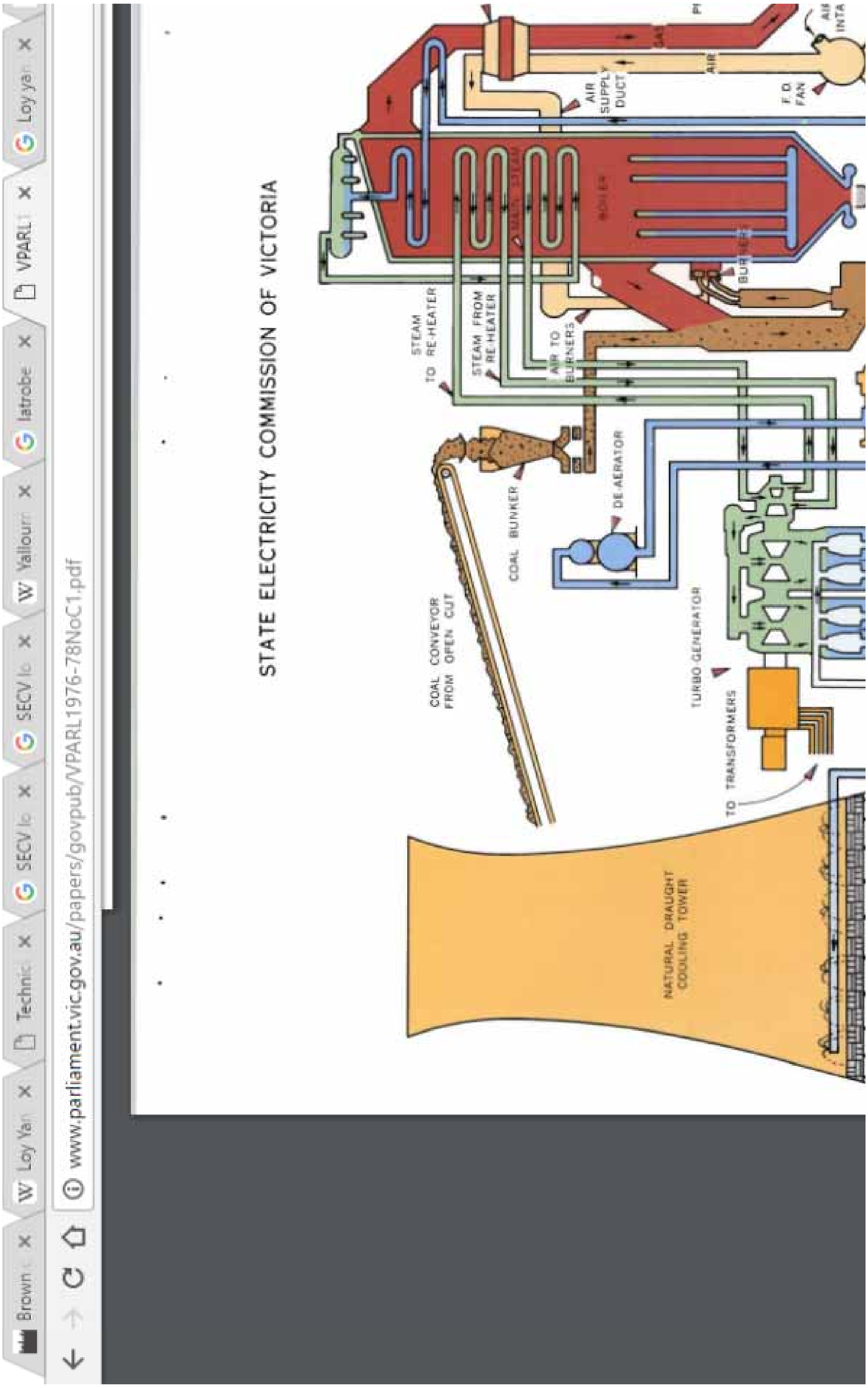
	Achievement	Year accomplished
1	Operated a dedicated fire and rescue service	1920
2	Built and managed the company town of Yallourn for workers of the Yallourn power station	1921
3	Operated a 900 mm gauge electric railway at Yallourn to convey coal from the open cut, later extended to Morwell and Hazelwood	1922
4	Constructed Newport B power Station	1923
5	Built Yallourn A Power Station	1924
6	Extraction of brown coal at Yallourn open cut mine	1924
7	Built the Hydroelectric scheme at Rubicon	1929
8	Constructed Newport C power Station	1947
9	Produced briquettes at Yallourn and Morwell from brown coal	1949
10	Continued development for Hydroelectric resources at Eildon and Kiewa	1951
11	Introduced the rural electrification throughout Victoria	1951
12	Built Hazelwood Power Station	1971
13	Yallourn W power station replaced Yallourn (A,B,C,D and E) Power Station	1974
14	Extraction of brown coal at Loy Yang open cut mine	1980
15	Built Loy Yang A Power Station	1984
16	Built Loy Yang B Power Station	1993

Appendix 4: Layout of Loy Yang A Power Station



Layout of Loy Yang A Power Station as proposed to the government in 1976. Image: SECV.

A 3-Dimensional representation of Loy Yang B Power Station.
Image: SECV, annual report 1987/1988.



Typical schematic layout of a turbine unit at Loy Yang Power Station in 1976. Image: SECV.

Change Control

CHANGE CONTROL		
VERSION 1	18 JANUARY 2017	FIRST DRAFT
VERSION 2	2 FEBRUARY 2017	SECOND DRAFT WITHOUT TRACK CHANGES
VERSION 3	19 FEBRUARY 2017	SECOND DRAFT WITHOUT TRACK CHANGES
VERSION 4	20 FEBRUARY 2017	FINAL DRAFT FROM STUDENTS
VERSION 5	5 MAY 2017	FIRST REVIEW BY OP
VERSION 6	20 NOVEMBER 2017	COMPRESSED TO 11 PAGES
VERSION 7	11 JANUARY 2018	SECOND REVIEW BY OP
VERSION 8	1 4 JUNE 2018	REVIEW BY IRN
VERSION 9	3 JULY 2018	REFORMAT AND REVIEW BY OP
VERSION 10	16 JULY 2018	INCORPORATED FURTHER CHANGES BY IRN
VERSION 11	27 JULY 2018	INCORPORATED 3 ADDITIONAL IMAGES FROM IRN